GEORGIA INSTITUTE OF TECHNOLOGY
Engineering Experiment Station

PROJECT INITIATION

Date: 4/20/71

Project Title: **Polarization Modulation Techniques**

Project No.: **A-1325**

Project Director: **Mr. R. J. Hodges**

Sponsor: **Aeronautical Systems Division (AFSC); Wright-Patterson AFB**

Effective . . . . . April 15, 1971 . . . . . Estimated to run until: . . . . April 30, 1973* . . . . .

Type Agreement: . . Contract No. F33615-71-C-1519 . . . . . Amount: $ 199,988.00** . . . . . .

*Additional time for Final Reporting only.
**Partially funded at $90,000 thru 12/15/71.

Reports/Data Required: Monthly Status Reports; Interim Technical Report; Presentation Material; TRACE Report; and Final Technical Report. (See separate Report Due Date Schedule for details)

Final: SECRET

Sponsor Contact Persons: Technical Matters
Mr. James V. Kastle, AFAL/WRW
Project Engineer
Air Force Avionics Laboratory
Wright-Patterson AFB, Ohio 45433

Administrative Matters
Administrative Contracting Officer
Aeronautical Systems Division
ATTN: FTKSA
Wright-Patterson AFB, Ohio 45433

Defense Priority Rating: DO-C9 under DMS Reg. 1.

Assigned to . . . Electronics (Radar Branch) . . . . . Division

COPIES TO:

- ☐ Project Director
- ☐ Director
- ☐ Associate Director
- ☐ Assistant Director(s)
- ☐ Division Chiefs
- ☐ Branch Head
- ☐ General Office Services
- ☐ Engineering Design Services
- ☐ Photographic Laboratory
- ☑ Research Security Officer
- ☐ Accounting
- ☐ Purchasing
- ☐ Report Section
- ☐ Library
- ☐ Rich Electronic Computer Center
- ☐ _____

RA-62(12-66)

GEORGIA INSTITUTE OF TECHNOLOGY
Engineering Experiment Station

PROJECT TERMINATION

Date November 6, 1973

PROJECT TITLE: **Polarization Modulation Techniques**

PROJECT NO: **A-1325**

PROJECT DIRECTOR: **Mr. R. J. Hodges**

SPONSOR: **Hq., 4950th Test Wing/PMEB; Wright-Patterson AFB, Ohio**

TERMINATION EFFECTIVE: ~~July 15, 1973~~ **(Final Report due date)**

CHARGES SHOULD CLEAR ACCOUNTING BY: ~~N/A - all funds expended.~~

CONTRACT CLOSEOUT ITEMS REMAINING: **Final Invoice & Closing Documents**
Final Report of Inventions
Gov't. Property Inventory & Cert.
Classified Material Cert.

RADAR DIVISION

COPIES TO:

Project Director
Director
Associate Director
Assistant Directors
Division Chief
Branch Head
Accounting
Engineering Design Services
General Office Services
Photographic Laboratory
Purchasing
Report Section
Library
Security
Rich Electronic Computer Center

Form EES 402 (R10-62)

ENGINEERING EXPERIMENT STATION
GEORGIA INSTITUTE OF TECHNOLOGY
225 North Avenue, Northwest · Atlanta, Georgia 30332

28 May 1971

Air Force Avionics Laboratory
Wright-Patterson Air Force Base
Ohio 45433

Attention: Mr. James V. Kastle - AFAL/WRW

Subject: Status Report 1
Project 4036
"Polarization Modulation Techniques"
Contract No. F33615-71-C-1519

Gentlemen:

A summary of the progress for the period 15 April through 30 April 1971 is contained herein.

Technical Progress

The first phase of the subject contract is to conduct a survey and analysis of radars that will be used with the controlled polarization antenna field tests. The radars currently being considered for investigation are;

1. HAVE BRACKET,
2. HAVE CLUTCH, and
3. SO-8.

The SO-8 is a Georgia Tech owned S-band radar that has been in storage for the past two years. Plans have been completed to assemble this system in the bay area of the Electronics Research Building and to conduct a complete mechanical and electrical checkout. After the checkout has been completed, the system will be placed in operation on the roof of the Electronics Research Building. This location will provide close in (less than one mile) field tests to be conducted at Georgia Tech. A list of SO-8 radar parameters is attached.

Report of Effort

Name	April Hours	Cumulative Hours	Technical Area During Report Period
Hodges, Richard J. Research Engineer	88	88	Project Director

Visits

Mr. James V. Kastle of AFAL/WRW visited Georgia Tech on 27 and 28 April 1971. The purpose of this visit was to discuss work to be performed on the subject contract.

Future Effort

The analysis of the above mentioned radar systems will be initiated.

The installation of the SO-8 radar system will be initiated. First, the system will undergo a complete mechanical and electrical checkout. Next, the antenna patterns will be measured to determine the parallel and cross polarization characteristics. Finally, the system will be placed in operation on the roof of the Electronics Research Building.

A program will be developed to evaluate and test the controlled polarization antenna. The objectives for this program are as follows:

1. The system will be tested to insure that it was not damaged during shipment.

2. The system parameters and their range of variation will be measured. This knowledge will be used to specify tolerances for future production models of the controlled polarization antenna.

3. The reliability and operational characteristics of the controlled polarization antenna will be determined. This information is vital for well designed field test programs.

Respectfully submitted,

R. J. Hodges
Project Director

Approved:

H. A. Ecker
Head, Radar Branch

RJH:am

SO-8 RADAR SYSTEM PARAMETERS

RF frequency	2900-3100 MHz
Antenna type	Parabolic section
Antenna beamwidths	10° Az
	22.5° El
Antenna gain	20 dB (estimated)
Peak power	75 kW
PRF	400 ± 10 pps
Pulsewidth	1 μs
IF center frequency	30 MHz
IF bandwidth	1.5 MHz
Primary power	115 volts dc
	70 amperes starting current
	17 amperes running current

ENGINEERING
GEORGIA INSTITUTE OF TECHNOLOGY
EXPERIMENT STATION 225 North Avenue, Northwest · Atlanta, Georgia 30332

20 August 1971

Air Force Avionics Laboratory
Wright-Patterson Air Force Base,
Ohio 45433

Attention: Mr. James V. Kastle - AFAL/WRW

Subject: Status Report 4
Project 4036
"Polarization Modulation Techniques"
Contract No. F33615-71-C-1519

Gentlemen:

A summary of the progress for the period 1 July through 31 July 1971 is contained herein.

Technical Progress

The Hewlett-Packard 8620A sweep oscillator, 8621A RF Section, 8633A Oscillator Module, and 787D Directional Detector were received during this report period. Performance measurements were made, and all components are functioning properly.

The acceptance tests on the one-watt TWT amplifier were completed on 12 July 1971. These test results indicate that this amplifier is functioning properly. The two high-power TWT amplifiers arrived at Georgia Tech on 21 July 1971 after being modified by Keltec Florida. These amplifiers now have Type TNC input connectors, Type N output connectors and panel mounted ellapsed time meters. In addition to this, the amplifiers have been completely enclosed. The acceptance tests on these high-power TWT amplifiers are currently being performed.

After the acceptance tests on the one-watt TWT amplier were completed, a test program was initiated with the SO-8 radar to measure its polarization characteristics as a function of azimuth scan angle. The SO-8 was modified to provide azimuth scan angle readouts to within $\pm$ 0.5 degrees, and the antenna drive system was modified to provide variable scan rates from 2 to 10 revolutions per minute. Using the controlled polarization antenna as a polarimeter, the polarization was measured at two degree increments on the principal axis and at a location six degrees below the principal axis. These measurements indicate that the cross component deviates slightly about some average value (approximately 20 dB below the peak parallel component) at all azimuth angles.

The parallel component usually is slightly larger than the cross component at all azimuth angles off of the main lobe. The cross component is larger than the parallel component only when the parallel component is in a null; however, the nulls are usually quite narrow. Thus, no large sidelobes and no points where the cross component was extremely large were found.

Report of Effort

Name	July Hours	Cumulative Hours	Technical Area During Reporting Period
Cain, Fred L. Senior Research Engineer		8	
Cherry, Bruce M. Assistant Research Engineer	51	221	GT-2 Preparation
Ecker, H. Allen Principal Research Engineer	18	53	Consulting
Edwards, J. Lee Senior Research Engineer	120	155	Threat Analysis
Evans, James L. Co-op Trainee		83	
Flynt, Edward R. Principal Research Engineer	35	104	Consulting
Greneker, Eugene F. Graduate Research Assistant	57	169	Engineering Assistance
Higgins, James D. Assistant Research Engineer	168	344	TWT Acceptance
Hodges, Richard J. Research Engineer	172	584	Project Director
Miller, Thomas M. Research Engineer		8	
Siegel, William G. Co-op Trainee		3.5	

Future Effort

The acceptance tests on the high-power TWT amplifiers will be completed.

Personnel at NAS Atlanta will be contacted to discuss the possibility of utilizing their Ground Control Approach radar, AN/CPN-4, for tests with the Controlled Polarization Antenna. This radar has two polarizations, horizontal and circular, and various signal processing capabilities including MTI, FTC, and STC.

The Georgia Tech K_u-band mobile radar van (GT-2) will be modified to house the controlled Polarization Antenna during field tests.

Respectfully submitted,

Richard J. Hodges
Project Director

Approved:

H. A. Ecker
Head, Radar Branch

RJH:sp

ENGINEERING
GEORGIA INSTITUTE OF TECHNOLOGY
EXPERIMENT STATION

225 North Avenue, Northwest · Atlanta, Georgia 30332

23 September 1971

Air Force Avionics Laboratory
Wright-Patterson Air Force Base,
Ohio 45433

Attention: Mr. James V. Kastle - AFAL/WRW

Subject: Status Report 5
Project 4036
"Polarization Modulation Techniques"
Contract No. F33615-71-C-1519

Gentlemen:

A summary of the progress for the period 1 August through 31 August 1971 is contained herein.

Technical Progress

The acceptance tests on the high-power TWT amplifiers were completed on 13 August 1971. These test results indicate that the amplifiers are operating properly. The second-harmonic signals from the high-power TWT amplifiers are within specifications, but are too large for proper operation of the Hewlett-Packard Sampling Scope. This problem will be eliminated by installing two reflection type low-pass filters on the antenna. Two low-pass filters have been ordered that will have at least 30 dB of attenuation at the lowest second-harmonic frequency. Mr. John Wadkowski of Keltech Florida advises that the out-of-band mismatch for the TWT amplifiers should not exceed a 2:1 VSWR. Thus, proper pads will be installed ahead of the low-pass filters to insure that the TWT amplifiers will not be damaged.

Captain T. J. Taylor, Commander, Naval Air Station Atlanta, was contacted on 10 August 1971 to discuss the possibility of utilizing his GCA radar (AN/CPN-4) for some evaluation tests of the controlled polarization antenna. Capt. Taylor agreed to allow such a test program to be conducted, and he suggested that the final details be arranged with Cmdr. K. J. Sikes, Air Operations Officer, Lt. Cmdr. W. E. Heppard, Ground Electronics Officer, and Lt. R. D. Johns, GCA Officer. A tentative test plan was discussed with these Navy personnel on 13 August 1971. It was agreed that the test program would begin on 13 September 1971 and that the program would be carried out in two phases. Phase I is to be a measurements program that will determine the

radar's polarization characteristics as a function of azimuth scan angle and elevation tilt angle. Phase II of the operation will be to evaluate the effectiveness of the controlled polarization antenna. The total operation at NAS Atlanta will last approximately three weeks. A list of the important parameters for this GCA radar is attached.

Georgia Tech's K_u-band mobile radar van (GT-2) has been modified to house the controlled polarization antenna during field operations. The modifications to the van included mounting the high-power TWT amplifiers with sufficient sound absorption material and providing 400 cycle power capabilities for these amplifiers.

Mr. John Killingsworth, TGPE, of the Armament Development and Test Center was contacted on 30 August 1971 to discuss the possibility of performing controlled polarization antenna tests on the HAVE CLUTCH, HAVE FEAST, and HAVE BRACKET programs. Mr. Killingsworth advised that the HAVE CLUTCH is no longer available at Eglin AFB; however, arrangements for the other two programs can be made with Mr. James C. Walker, TGPE. Mr. Walker agreed to meet with Georgia Tech personnel on 9, 10 September 1971 to discuss the test programs being requested. He also indicated that the Georgia Tech personnel would be allowed to visit the various proposed test sites and inspect the equipment at these test sites.

Report of Effort

Name	August Hours	Cumulative Hours	Technical Area During Reporting Period
Cain, Fred L. Senior Research Engineer		8	
Cherry, Bruce M. Asst. Research Engineer		221	
Ecker, H. Allen Prin. Research Engineer	18	71	Consulting
Edwards, J. Lee Senior Research Physicist	88	243	Threat Analysis
Evans, James L. Co-op Trainee		83	
Flynt, Edward R. Prin. Research Engineer	28	132	Consulting

Report of Effort (Continued)

Name	August Hours	Cumulative Hours	Technical Area During Reporting Period
Greneker, Eugene F. Graduate Research Asst.	28	197	Engineering Assistance
Higgins, James D. Asst. Research Engineer	162	506	Field Trip Preparation
Hodges, Richard J. Research Engineer	158	742	Project Director
Miller, Thomas M. Research Engineer		8	
Siegel, William G. Co-op Trainee		3.5	

Visits

Dr. H. A. Ecker and Mr. R. J. Hodges of Georgia Tech visited Mr. James V. Kastle at the Avionics Laboratory on 26 August 1971. The purpose of this visit was to discuss work to be performed on the subject contract with particular emphasis on what systems should be used for field tests with the controlled polarization antenna.

Future Effort

The controlled polarization antenna evaluation will be conducted at NAS Atlanta during the period 13 September through 1 October 1971.

Dr. J. L. Edwards and Mr. R. J. Hodges of Georgia Tech will visit Eglin AFB, Florida on 9, 10 September 1971. The purpose of this visit will be to discuss future tests on the HAVE FEAST and HAVE BRACKET programs.

Respectfully submitted,

Richard J. Hodges
Project Director

Approved:

H. A. Ecker
Head, Radar Branch

RJH:sp

AN/CPN-4 GROUND CONTROL APPROACH RADAR SYSTEM PARAMETERS

Pulse Width	0.5 microseconds
PRF	1500
Peak Power	600 kW
Average Power	450 watts
Nominal Frequency	2800 MHz
Antenna Beamwidths	1° Az ≈40° El (Cosecant Squared)
Antenna Polarization	Horizontal or Circular
Antenna TiH	0° to +10°
Antenna Scan Speed	20 rpm
Signal Processing Circuits	Phase Coherent MTI FTC STC

ENGINEERING EXPERIMENT STATION 225 North Avenue, Northwest · Atlanta, Georgia 30332

31 January 1972

Air Force Avionics Laboratory
Wright-Patterson Air Force Base,
Ohio 45433

Attention: Mr. James V. Kastle - AFAL/WRW

Subject: Status Report 9
Project 7636
"Polarization Modulation Techniques"
Contract No. F33615-71-C-1519

Gentlemen:

A summary for the period 1 December through 31 December 1971 is contained herein.

Technical Progress

Preparations for the field test operations to be conducted at Eglin AFB, Florida are being continued. The test sites at A-3 and A-7 were revisited during this reporting period to obtain the information required to design the final test plans. Mr. James C. Walker at the Armament Development and Test Center insures us that these operations will begin on 14 February 1972.

A chevrolet step-van arrived at Georgia Tech on 14 December 1971 and is currently being outfitted for use as a mobile laboratory on the subject contract. The designation for this mobile van is GT-4. The completed van will contain a 60 Hz generator, an air conditioner, a citizens-band radio, the CPA, and its associated equipment. A trailer mounted 400 Hz generator will accompany the van and provide the power required for the TWT's. The outfitting of the van is expected to be completed prior to beginning the field test operations at Eglin AFB, Florida.

A paper entitled "Potential Impact of Polarization in ECCM and ECM" is being prepared for submission to the Eighteenth Annual Tri-Service Radar Symposium. An outline has been constructed, and a summary is currently being written. The summary is to be submitted for initial acceptance prior to 11 January 1972. If accepted, the notification will be received shortly after 25 January 1972, and the complete paper must be submitted for final acceptance prior to 15 March 1972.

Report of Effort

Name	December Hours	Cumulative Hours	Technical Area During Reporting Period
Cain, Fred L. Senior Research Engineer		8	
Cherry, Bruce M. Assistant Research Engineer		221	
Ecker, H. Allen Principal Research	18	142	Consulting
Edwards, J. Lee Senior Research Engineer	140	861	Theoretical Analysis
Evans, James L. Co-op Trainee		83	
Flynt, Edward R. Principal Research Engineer	33	269	Consulting
Greneker, Eugenc F. Assistant Research Engineer		199	
Higgins, James D. Assistant Research Engineer	184	1179	Field Trip Preparation
Hodges, Richard J. Research Engineer	184	1397	Project Director
Lucas, Robert J. Co-op Trainee	40	344	Engineering Assistance
Miller, Thomas M. Research Engineer		8	
Siegel, William G. Co-op Trainee		3.5	
Weaver, E. E. Assistant Research Scientist	44	44	Field Trip Preparation

Visits

Dr. J. L. Edwards and Mr. R. J. Hodges of Georgia Tech and Mr. George Vogel of the Air Force Avionics Laboratory visited Mr. James C. Walker, et al. at the Armament Development and Test Center, Eglin Air Force Base, Florida. The purpose of the visit was to discuss the forthcoming field test operations to be conducted with the controlled polarization antenna.

Future Effort

Preparations for the field test operations to be conducted at Eglin AFB, Florida will be continued. The efforts will be concentrated on designing the final test plan, outfitting GT-4, and fabrication of the inverse gain receiver.

The work on the Tri-Service Radar Symposium publication will be continued. The summary will be completed and submitted prior to 11 January 1972.

A visit with Mr. James V. Kastle at the Air Force Avionics Laboratory is planned for 5 January 1972. The purpose of this visit will be to discuss work to be performed on the subject contract.

The proposed field test operations at Eglin AFB will end approximately 17 March 1972, and the Interim Report for the subject contract is due 15 April 1972. In order to include these field test results in the Interim Report, it will be necessary to delay the due date. A date of 15 June 1972 would be suitable, and it is being requested that the Project Engineer issue a Contract Modification to this effect.

Respectfully submitted,

Richard J. Hodges
Project Director

Approved:

H. A. Ecker
Head, Radar Branch

RJH:bp

ENGINEERING
GEORGIA INSTITUTE OF TECHNOLOGY
EXPERIMENT STATION 225 North Avenue, Northwest · Atlanta, Georgia 30332

26 April 1972

Air Force Avionics Laboratory
Wright-Patterson Air Force Base
Ohio 45433

Attention: Mr. James V. Kastle - AFAL/WRW

Subject: Status Report 11
Project 7636
"Polarization Modulation Techniques"
Contract No. F33615-71-C-1519

Gentlemen:

A summary for the period 1 February through 29 February 1972 is contained herein.

Technical Progress

The outfitting of the mobile laboratory, GT-4, was completed during this reporting period. This van contains a 60 Hz generator, an air conditioner, a citizens band radio, the CPA, and its associated equipment. A trailer mounted 400 Hz generator accompanies the van and provides the power required for the TWT's. This mobile laboratory was designed to be self-sustaining; thus, allowing field test operations to be conducted with minimal outside support. The van is currently being used in the field test operations being conducted at Eglin Air Force Base, Florida.

The field test operations at Eglin Air Force Base began on 22 February and are scheduled to last through 14 April 1972. This eight-week period will include a six-week measurements program on the WEST IB, WEST IX and SADS I systems and a two-week CPA evaluation program on the WEST IB and SADS I systems. A summary of the mission hours obtained and estimates of overtime utilized during this reporting period are attached to this report.

The summary for a paper entitled "Potential Impact of Polarization in ECCM and ECM" was accepted by the Eighteenth Annual Tri-Service Radar Symposium Papers Committee. The completed paper is to be submitted for acceptance prior to March 15, 1972. If accepted, the paper will be presented at Monterey, California on 6, 7, 8 June 1972.

Report of Effort

Name	February Hours	Cumulative Hours	Technical Area During Report Period
Akridge, James M. Senior Research Engineer		102	
Cain, Fred L. Senior Research Engineer		8	
Cherry, Bruce M. Assistant Research Engineer		221	
Ecker, H. Allen Principal Research Engineer	17	176	Consulting
Edwards, J. Lee Senior Research Scientist	118	1021	Theoretical Analysis
Evans, James L. Co-op Trainee		83	
Foard, William W. Co-op Trainee	32	200	Engineering Assistance
Flynt, Edward R. Principal Research Engineer	34	337	Consulting
Greneker, Eugene F. Assistant Research Scientist		199	
Higgins, James D. Assistant Research Engineer	168	1515	Field Trip Preparation
Hodges, Richard J. Research Engineer	168	1725	Project Director
Lucas, Robert J. Co-op Trainee		447	
Martin, E. Eugene Research Engineer	13	13	Field Trip Preparation
Miller, Thomas M. Research Engineer		8	

Report of Effort (Continued)

Name	February Hours	Cumulative Hours	Technical Area During Report Period
Pugh, William E. Graduate Research Assistant	4.5	20.5	Engineering Assistance
Siegel, William G. Co-op Trainee		64.5	
Weaver, E. E. Assistant Research Scientist	121	325	Field Trip Preparation

Visits

Mr. R. J. Hodges of Georgia Tech visited Mr. J. V. Kastle of the Air Force Avionics Laboratory on 9 February 1972. The purpose of this visit was to discuss the field test operations to be conducted at Eglin Air Force Base, Florida.

Dr. J. L. Edwards and Messrs. J. D. Higgins and R. J. Hodges arrived at Eglin Air Force Base on 21 February 1972 to conduct the CPA Field Operations. This trip is scheduled to last through 14 April 1972.

Future Effort

The field operations at Eglin Air Force Base, Florida will continue throughout the next reporting period.

The radar symposium paper will be completed and submitted prior to 15 March 1972.

Respectfully submitted,

Richard J. Hodges
Project Director

Approved:

H. Allen Ecker
Chief, Radar Division

SUMMARY OF MISSION HOURS AND OVERTIME ESTIMATES

Date	System	Mission Hours	Estimated Overtime Hours	Estimated No. Personnel on Overtime	Estimated Overtime Manhours
2-23-72	WEST IB	2.50	1.00	3	3.00
2-24-72	WEST IB	3.00	3.50	3	10.50
2-25-72	WEST IB	3.00	1.00	2	2.00
2-28-72	WEST IX	2.00	4.00	4	16.00
2-29-72	WEST IB	3.75	4.75	2	9.50
February Totals:		14.25	14.25		41.00

GEORGIA INSTITUTE OF TECHNOLOGY
EXPERIMENT STATION 225 North Avenue, Northwest · Atlanta, Georgia 30332

27 April 1972

Air Force Avionics Laboratory
Wright-Patterson Air Force Base,
Ohio 45433

Attention: Mr. James V. Kastle

Subject: Status Report 12
Project 7636
"Polarization Modulation Techniques"
Contract No. F33615-71-C-1519

Gentlemen:

A summary for the period 1 March through 31 March 1972 is contained herein.

Technical Progress

The paper entitled "Potential Impact of Polarization in ECCM and ECM" was submitted for review to Mr. William N. Shaddix at the Naval Research Laboratory on 13 March 1972. This paper is being submitted for presentation at the Eighteenth Annual Tri-Service Radar Symposium to be conducted on 6, 7, 8 June at Monterey, California. Official notification of acceptance should be received early within the next reporting period.

The field test operations at Eglin Air Force Base, Florida have continued throughout this reporting period. The measurements phase of the test program has been completed on the WEST IB and is 90% complete on the WEST IX. A summary of the mission hours obtained and estimates of overtime utilized during this reporting period are attached to this report. The measurements phase should be completed on the WEST IX and SADS I during the next reporting period.

It is anticipated that a break between the measurements phase and CPA evaluation phase of the field test operations will be requested. A two-week period is being considered to allow a preliminary analysis of the data to be conducted. This analysis needs to be performed prior to designing the final test plans for the evaluation phase. This time period would also be utilized to reoutfit Georgia Tech's mobile van and convert it from its passive configuration to an active configuration.

Report of Effort

Name	March Hours	Cumulative Hours	Technical Area During Reporting Period
Akridge, James M. Senior Research Engineer		102	
Cain, Fred L. Senior Research Engineer		8	
Cherry, Bruce M. Assistant Research Engineer		221	
Ecker, H. Allen Principal Research Engineer	37	213	Consulting
Edwards, J. Lee Senior Research Scientist	184	1265	Field Test Operations
Evans, James L. Co-op Trainee		83	
Foard, William W. Co-op Trainee	32	232	Engineering Assistance
Flynt, Edward R. Principal Research Engineer		337	
Greneker, Eugene F. Assistant Research Scientist		199	
Higgins, James D. Assistant Research Engineer	184	1699	Field Test Operations
Hodges, Richard J. Research Engineer	184	1725	Project Director
Klein, Steven B. Co-op Trainee	72	72	Engineering Assistance
Lucas, Robert J. Co-op Trainee		447	
Martin, E. Eugene Research Engineer		13	

Report of Effort (Continued)

Name	March Hours	Cumulative Hours	Technical Area During Reporting Period
Miller, Thomas M. Research Engineer		8	
Pugh, William G. Graduate Research Assistant		20.5	
Siegel, William G. Co-op Trainee		64.5	
Weaver, E. E. Assistant Research Scientist		325	

Visits

Dr. J. L. Edwards and Messrs. J. D. Higgins and R. J. Hodges were at Eglin Air Force Base, Florida throughout this reporting period. The purpose of this visit was to conduct the CPA field operations.

Mr. W. W. Foard visited Eglin Air Force Base during 13-17 March 1972. The purpose of this visit was to assist in the CPA field operations.

Future Effort

The field operations at Eglin Air Force Base, Florida will continue throughout the next reporting period.

If accepted, preparations for the radar symposium presentation will be continued.

Respectfully submitted,

Richard J. Hodges
Project Director

Approved:

H. Allen Ecker
Chief, Radar Division

SUMMARY OF MISSION HOURS AND OVERTIME ESTIMATES

Date	System	Mission Hours	Estimated Overtime Hours	Estimated No. Personnel on Overtime	Estimated Overtime Manhours
3-1-72	WEST IB	3.00	4.50	2	9.00
3-2-72	WEST IX	2.00	4.00	4	16.00
3-3-72	WEST IB	3.00	2.25	1	2.25
			4.25	2	8.50
3-6-72	WEST IB	3.00	2.00	3	6.00
3-7-72	WEST IB	2.50	4.00	3	12.00
3-8-72	WEST IB	3.00	3.75	3	11.25
3-9-72	WEST IB	3.00	3.75	3	11.25
3-10-72	WEST IB	2.50	4.00	1	4.00
3-13-72	WEST IB	3.25	5.00	4	20.00
3-14-72	WEST IB	2.25	4.25	4	17.00
3-15-72	WEST IX	6.00	3.50	4	14.00
3-16-72	WEST IB	1.75	3.00	4	12.00
3-17-72	WEST IB	3.00	5.00	4	20.00
3-21-72	WEST IX	2.75	3.50	4	14.00
3-22-72	WEST IX	3.25	5.00	4	20.00
3-23-72	WEST IX	3.00	5.00	4	20.00
3-27-72	WEST IX	2.00	3.50	4	14.00
3-28-72	WEST IX	3.25	5.00	4	20.00
3-29-72	WEST IX	4.75	4.75	4	19.00
3-30-72	WEST IX	1.25	3.25	4	13.00
	March Totals	58.50	87.75		296.75
	Feb. Totals	14.25	14.25		41.00
	Cumulative Totals:	72.75	102.00		337.75

GEORGIA INSTITUTE OF TECHNOLOGY
EXPERIMENT STATION 225 North Avenue, Northwest · Atlanta, Georgia 30332

15 June 1972

Air Force Avionics Laboratory
Wright-Patterson Air Force Base,
Ohio 45433

Attention: Mr. James V. Kastle

Subject: Status Report 13
Project 7636
"Polarization Modulation Techniques"
Contract No. F33615-71-C-1519

Gentlemen:

A summary for the period 1 April through 30 April 1972 is contained herein.

Technical Progress

The paper entitled "Potential Impact of Polarization in ECCM and ECM" has been officially accepted for presentation at the Eighteenth Annual Tri-Service Radar Symposium and for publication in the Symposium Record. This symposium will be conducted on 6, 7, 8 June 1972 at the Naval Postgraduate School in Monterey, California.

The field test operations at Eglin Air Force Base, Florida have continued throughout this reporting period. The measurements phases of this test program were completed as follows:

System	Date of Completion
WEST IB	17 March 1972
WEST IX	14 April 1972
SADS I	15 April 1972

A summary of the mission hours obtained and estimates of overtime utilized during this reporting period are attached to this report.

The period of 16 April through 30 April 1972 was used to perform a preliminary analysis of the data and to design a test plan for the evaluation

(active) phase of the test program. This period was also utilized to reoutfit Georgia Tech's mobile van and convert it from its passive configuration to an active configuration. The active tests are scheduled to begin on 3 May 1972.

Report of Effort

Name	April Hours	Cumulative Hours	Technical Area During Reporting Period
Akridge, James M. Senior Research Engineer		102	
Cain, Fred L. Senior Research Engineer		8	
Cherry, Bruce M. Assistant Research Engineer		221	
DeCastra, Joseph E., III Co-op Trainee	8	8	Engineering Assistance
Ecker, H. Allen Principal Research Engineer	16	229	Consulting
Edwards, J. Lee Senior Research Scientist	91	1356	Field Test Operations
Evans, James L. Co-op Trainee		83	
Foard, William W. Co-op Trainee	40	272	Engineering Assistance
Flynt, Edward R. Principal Research Engineer		337	
Greneker, Eugene F. Assistant Research Scientist		199	
Higgins, James D. Assistant Research Engineer	147	1846	Field Test Operations
Hodges, Richard J. Research Engineer	154	2063	Project Director

Report of Effort (Continued)

Name	April Hours	Cumulative Hours	Technical Area During Reporting Period
Klein, Stephen B. Co-op Trainee		72	
Lucas, Robert J. Co-op Trainee		447	
Martin, E. Eugene Research Engineer		13	
Miller, Thomas M. Research Engineer		8	
Pugh, William E. Graduate Research Asst.		20.5	
Siegel, William G. Co-op Trainee		64.5	
Smilay, David H. Co-op Trainee	8	8	Engineering Assistance
Trebits, Robert N. Research Scientist	160	160	Data Analysis
Weaver, E. Eugene Assistant Research Scientist		325	

Visits

Dr. J. L. Edwards and Messrs. J. D. Higgins and R. J. Hodges were at Eglin Air Force Base, Florida throughout this reporting period. The purpose of this visit was to conduct the CPA field operations.

Future Effort

The field operations at Eglin Air Force Base, Florida will continue throughout the next reporting period.

Preparations for the Eighteenth Annual Tri-Service Radar Symposium presentation will be continued.

Respectfully submitted,

Richard J. Hodges
Project Director

Approved:

H. Allen Ecker
Chief, Radar Division

RJH:sp

SUMMARY OF MISSION HOURS AND OVERTIME ESTIMATES

Date	System	Mission Hours	Estimated Overtime Hours	Estimated No. Personnel On Overtime	Estimated Overtime Manhours
4- 3-72	SADS I	3.00	1.50	5	7.50
4- 5-72	SADS I	2.75	0		
4- 6-72	SADS I	3.00	3.50	5	17.50
4- 7-72	SADS I	8.00	9.00	5	45.00
4-10-72	SADS I	3.00	5.00	5	25.00
4-11-72	SADS I	3.75	5.50	5	27.50
4-12-72	SADS I	6.25	6.50	5	32.50
4-14-72	WEST IX	4.00	6.00	4	24.00
4-15-72	SADS I	8.00	10.00	5	50.00
April Totals:		41.75	47.00		229.00
March Totals:		58.50	87.75		296.75
February Totals:		14.25	14.25		41.00
Cumulative Totals:		114.50	149.00		566.75

GEORGIA INSTITUTE OF TECHNOLOGY
EXPERIMENT STATION 225 North Avenue, Northwest · Atlanta, Georgia 30332

18 July 1972

Air Force Avionics Laboratory
Wright-Patterson Air Force Base,
Ohio 45433

Attention: Mr. James V. Kastle - AFAL/WRW

Subject: Status Report 15
Project 7636
"Polarization Modulation Techniques"
Contract No. F33615-71-C-1519

Gentlemen:

A summary for the period 1 June through 30 June 1972 is contained herein.

Technical Progress

The paper entitled "Potential Impact of Polarization in ECCM and ECM" was presented by Dr. J. L. Edwards and Mr. R. J. Hodges of Georgia Tech at the Eighteenth Annual Tri-Service Radar Symposium on 6 June 1972. The symposium was held at the Naval Postgraduate School in Monterey, California. The final copy of this paper was submitted for publication in the Symposium Record on 2 June 1972.

The field test operations at Eglin Air Force Base, Florida have continued throughout this reporting period. The active phases of this test program were completed as follows:

System	Date of Completion
WEST IB	28 June 1972
WEST IX	29 June 1972
SADS I	29 June 1972

A summary of the mission hours obtained and estimates of overtime utilized during this reporting period are attached to this report.

Report of Effort

Name	June Hours	Cumulative Hours	Technical Area During Reporting Period
Akridge, James M. Senior Research Engineer		102	
Burns, C. Patrick Assistant Research Engineer		28	
Cain, Fred L. Senior Research Engineer		8	
Cherry, Bruce M. Assistant Research Engineer		221	
DeCastra, Joseph E. III Co-op Trainee	104	220	Engineering Assistance
Ecker, H. Allen Principal Research Engineer	26	292	Consulting
Edwards, J. Lee Senior Research Scientist	79	1498	Symposium Presentation
Evans, James L. Co-op Trainee		83	
Foard, William W. Co-op Trainee	21	293	Engineering Assistance
Flynt, Edward R. Principal Research Engineer		346	
Greneker, Eugene F. Assistant Research Scientist		199	
Higgins, James D. Assistant Research Engineer	176	2206	Field Test Operations
Hodges, Richard J. Research Engineer	169	2416	Project Director
Klien, Stephen B. Co-op Trainee		72	

Report of Effort (Continued)

Name	June Hours	Cumulative Hours	Technical Area During Reporting Period
Lucus, Robert J. Co-op Trainee		447	
Martin, E. Eugene Research Engineer		13	
Miller, Thomas M. Research Engineer	12	133	Data Analysis
Pugh, William E. Graduate Research Assistant		20.5	
Siegel, William G. Co-op Trainee		64.5	
Smilay, David H. Co-op Trainee		8	
Trebits, Robert N. Research Scientist	70	377	Data Analysis
Weaver, E. Eugene Assistant Research Scientist		325	

Visits

Dr. J. L. Edwards and Mr. R. J. Hodges of Georgia Tech and Mr. J. V. Kastle of AFAL/WRW attended the Eighteenth Annual Tri-Service Radar Symposium in Monterey, California on 6, 7, 8 June 1972. These personnel are co-authors of the paper "Potential Impact of Polarization in ECCM and ECM" which was presented at the symposium.

Messers. W. W. Foard, J. D. Higgins, and R. J. Hodges of Georgia Tech were at Eglin Air Force Base, Florida throughout the period 20-30 June 1972. Dr. H. A. Ecker, also of Georgia Tech, was at this location during 28-30 June 1972. The purpose of these visits was to conduct the CPA Field operations.

Mr. J. V. Kastle of AFAL/WRW visited Eglin Air Force Base, Florida on 21, 22 June 1972. The purposes of this visit were to observe the CPA field operations being conducted by Georgia Tech and to discuss work to be performed on the subject contract.

Future Effort

Mr. J. W. Sarver of AFAL/WRW has requested that a technical summary of the CPA field evaluation be submitted on 14 July 1972.

The majority of the next reporting period will be utilized to prepare the Interim Technical Report for the subject contract.

The field operations at Eglin Air Force Base, Florida have been completed with one exception. The work pending is to collect and compile the raw data furnished by Vitro Services and the United States Air Force. In particular, video recordings were made throughout the active phase of the test program, and the video recordings are to be converted to TV recordings. This transfer will be accomplished by viewing the video recordings on radar displays and recording the images with a standard TV camera and tape recorder. It is anticipated that this work will not be accomplished during the next reporting period.

Respectfully submitted,

Richard J. Hŏdges
Project Director

Approved:

H. A. Ecker
Chief, Radar Division

RJH:bp

SUMMARY OF MISSION HOURS AND OVERTIME ESTIMATES

Date	System	Mission Hours	Estimates: Overtime Hours	Estimates: No. Personnel On Overtime	Estimates: Overtime Manhours
6-2-72	SADS I	2.00	0	-	0
6-21-72	SADS I	4.50	5.00	7	35.00
6-22-72	SADS I	3.75	3.50	7	24.50
6-23-72	SADS I	4.00	2.00	7	14.00
6-24-72	SADS I	5.75	8.75	13	113.75
6-26-72	SADS I	2.00	3.00	13	39.00
6-27-72	WEST IX	2.00	3.50	8	28.00
6-28-72	WEST IB	4.00	5.50	7	38.50
6-29-72	WEST IX	2.25	3.75	13	48.75
	SADS I	4.75	4.75	13	61.75
June Totals:		35.00	39.75		403.25
May Totals:		29.00	41.25		288.75
April Totals:		41.75	47.00		229.00
March Totals:		58.50	87.75		296.75
February Totals:		14.25	14.25		41.00
Cumulative Totals:		178.50	230.00		1258.75

GEORGIA INSTITUTE OF TECHNOLOGY
EXPERIMENT STATION 225 North Avenue, Northwest · Atlanta, Georgia 30332

14 September 1972

Air Force Avionics Laboratory
Wright-Patterson Air Force Base,
Ohio 45433

Attention: Mr. James V. Kastle - AFAL/WRW

Subject: Status Report 16
Project 7636
"Polarization Modulation Techniques"
Contract No. F33615-71-C-1519

Gentlemen:

A summary for the period 1 July through 31 July 1972 is contained herein.

Technical Progress

The majority of the reporting period was utilized for preparation of the Interim Technical Report for the subject contract. The preparation of the technical report will require a longer period of time than would normally be expected because this effort is being paralleled with an effort to reduce and analyze the data collected at Test Site A-3, Eglin AFB, Florida. The experimental tests at Test Site A-3 were concluded on 28 June 1972, and the parallel efforts were initiated immediately thereafter. The technical report will include, with one exception, a detailed summary of the technical progress for the period 15 April 1971 through 30 June 1972. The exception is the CPA evaluation tests conducted at Test Site A-7, Eglin AFB, Florida. The reason for this exclusion is that all of the data from these tests have not been compiled and collected. A separate report, containing the results of the A-7 tests, will be prepared and submitted to AFAL at a later date.

At the request of Mr. J. W. Sarver of AFAL/WRW, a "Preliminary Analysis of Data from Test Site A-3" was prepared and submitted to the Project Engineer on 14 July 1972. This document was a summary of the CPA evaluation tests conducted with the WEST IB at Eglin AFB, Florida.

Report of Effort

Name	July Hours	Cumulative Hours	Technical Area During Reporting Period
Akridge, James M. Senior Research Engineer		102	
Burns, C. Patrick Assistant Research Engineer		28	
Cain, Fred L. Senior Research Engineer		8	
Cherry, Bruce M. Assistant Research Engineer		221	
DeCastra, Joseph E., III Co-op Trainee		220	
Ecker, H. Allen Principal Research Engineer	17	309	Consulting
Edwards, J. Lee Senior Research Scientist	32	1530	Report Preparation
Evans, James L. Co-op Trainee		83	
Foard, William W. Co-op Trainee	168	461	Engineering Assistance
Flynt, Edward R. Principal Research Engineer		346	
Greneker, Eugene F. Assistant Research Scientist		199	
Higgins, James D. Assistant Research Engineer	155	2361	Report Preparation
Hodges, Richard J. Research Engineer	155	2571	Project Director

Report of Effort (Continued)

Name	July Hours	Cumulative Hours	Technical Area During Reporting Period
Klien, Stephen B. Co-op Trainee		72	
Lucas, Robert J. Co-op Trainee		447	
Martin, E. Eugene Research Engineer		13	
Miller, Thomas M. Research Engineer		133	
Pugh, William E. Graduate Research Assistant		20.5	
Siegel, William G. Co-op Trainee		64.5	
Smilay, David H. Co-op Trainee		8	
Trebits, Robert N. Research Scientist	50	427	Repcrt Preparation
Weaver, E. Eugene Assistant Research Scientist		325	

Future Effort

The majority of the next reporting period will be utilized to prepare the Interim Technical Report for the subject contract.

The video recordings still remaining at Eglin AFB, Florida are to be converted to TV recordings. This transfer will be accomplished by viewing the video recordings on radar displays and recording the images with a

standard TV camera and recorder. It is anticipated that this work will not be accomplished during the next reporting period.

Respectfully submitted,

Richard J. Hodges
Project Director

Approved:

H. A. Ecker
Chief, Radar Division

RJH:sp

GEORGIA INSTITUTE OF TECHNOLOGY
EXPERIMENT STATION 225 North Avenue, Northwest · Atlanta, Georgia 30332

21 November 1972

Air Force Avionics Laboratory
Wright-Patterson Air Force Base,
Ohio 45433

Attention: Mr. James V. Kastle - AFAL/WRW

Subject: Status Report 18
Project 7636
"Polarization Modulation Techniques"
Contract No. F33615-71-C-1519

Gentlemen:

A summary for the period 1 September through 30 September 1972 is contained herein.

Technical Progress

The majority of the reporting period was utilized for preparation of the Interim Technical Report for the subject contract. The preparation of this technical report has required a longer period of time than would normally be expected because this effort has been parallel with an effort to reduce and analyze the data collected at Test Site A-3, Eglin AFB, Florida. The technical report includes, with one exception, a detailed summary of the technical progress for the period 15 April 1971 through 30 June 1972. The exception is the CPA evaluation tests conducted at Test Site A-7, Eglin AFB, Florida. The reason for this exclusion is that all of the data from these tests have not been compiled and collected. A separate report, containing the results of the A-7 active tests, will be prepared and submitted to AFAL at a later date.

Report of Effort

Name	September Hours	Cumulative Hours	Technical Area During Reporting Period
Akridge, James M. Senior Research Engineer		102	
Burns, C. Patrick Research Engineer		28	

Report of Effort (Continued)

Name	September Hours	Cumulative Hours	Technical Area During Reporting Period
Cain, Fred L. Senior Research Engineer		8	
Cherry, Bruce M. Assistant Research Engineer		221	
DeCastra, Joseph E., III Co-op Trainee	16	236	Engineering Assistance
Ecker, H. Allen Principal Research Engineer	17	344	Consulting
Edwards, J. Lee Senior Research Scientist	15	1608	Report Preparation
Evans, James L. Co-op Trainee		83	
Foard, William W. Co-op Trainee	56	589	Engineering Assistance
Flynt, Edward R. Principal Research Engineer		346	
Greneker, Eugene F. Assistant Research Scientist		199	
Higgins, James D. Assistant Research Engineer	67	2518	Report Preparation
Hodges, Richard J. Research Engineer	155	2910	Project Director
Klien, Stephen B. Co-op Trainee		72	
Lucas, Robert J. Co-op Trainee		447	
Martin, E. Eugene Research Engineer		13	

Report of Effort (Continued)

Name	September Hours	Cumulative Hours	Technical Area During Reporting Period
McManus, J. Barry Co-op Trainee		16	
Miller, Thomas M. Research Engineer		140	
Pugh, William E. Graduate Research Assistant		20.5	
Siegel, William G. Co-op Trainee		64.5	
Smilay, David H. Co-op Trainee		8	
Trebits, Robert N. Research Scientist	158	714	Report Preparation
Weaver, E. Eugene Assistant Research Scientist		325	

Future Effort

The Interim Technical Report for the subject contract will be submitted to AFAL early during the next reporting period.

The video recordings still remaining at Eglin AFB, Florida are to be converted to TV recordings. This transfer will be accomplished by viewing the video recordings on radar displays and recording the images with a standard TV camera and recorder. This effort is scheduled to commence on 9 October 1972, and it will require approximately two weeks.

Respectfully submitted,

Richard J. Hodges
Project Director

Approved:

H. Allen Ecker
Chief, Radar Division

GEORGIA INSTITUTE OF TECHNOLOGY
EXPERIMENT STATION 225 North Avenue, Northwest · Atlanta, Georgia 30332

27 November 1972

Air Force Avionics Laboratory
Wright-Patterson Air Force Base,
Ohio 45433

Attention: Mr. James V. Kastle - AFAL/WRW

Subject: Status Report 19
Project 7636
"Polarization Modulation Techniques"
Contract No. F33615-71-C-1519

Gentlemen:

A summary for the period 1 October through 31 October 1972 is contained herein.

Technical Progress

The Interim Technical Report for the subject contract was submitted in draft form to AFAL on 9 October 1972. The technical report includes, with one exception, a detailed summary of the technical progress for the period 15 April 1971 through 30 June 1972. The exception is the CPA evaluation tests conducted at Test Site A-7, Eglin AFB, Florida. A separate report, containing the results of the A-7 tests, will be prepared and submitted to AFAL at a later date.

During the recent field operations conducted at Eglin AFB, Florida, video data were recorded at Test Sites A-3 and A-7, and these data were retained at Eglin AFB. During this reporting period a trip was made to Eglin AFB to collect these data. The video recordings from Test Site A-7 were played back on the radar displays at the site, and a standard TV camera and TV recorder were used to record the images from the radar displays. The data from Test Site A-3 were recorded by using the facilities available at Building 380, Freeman Mathematical Laboratory, at Eglin Main. The data from the manual tests conducted at A-3 were full video trains, and these data were converted to TV recordings of images displayed on an A-scope. The data from the automatic tests conducted at A-3 were range gated video, and these data were boxcarred and stored through use of a FM recorder. A list of the mission hours used and estimated overtime manhours incurred during this data collection program is attached to this report.

Report of Effort

Name	October Hours	Cumulative Hours	Technical Area During Reporting Period
Akridge, James M. Senior Research Engineer		102	
Burns, C. Patrick Research Engineer		28	
Cain, Fred L. Senior Research Engineer		8	
Cherry, Bruce M. Assistant Research Engineer		221	
DeCastra, Joseph E., III Co-op Trainee	92	328	Engineering Assistance
Ecker, H. Allen Principal Research Engineer	9	353	Consulting
Edwards, J. Lee Senior Research Scientist	53	1661	Report Preparation
Evans, James L. Co-op Trainee		83	
Foard, William W. Co-op Trainee	6	595	Engineering Assistance
Flynt, Edward R. Principal Research Engineer		346	
Greneker, Eugene F. Assistant Research Scientist		199	
Higgins, James D. Assistant Research Engineer	100	2618	Data Collection
Hodges, Richard J. Research Engineer	160	3070	Project Director
Klien, Stephen B. Co-op Trainee		72	

Report of Effort (Continued)

Name	October Hours	Cumulative Hours	Technical Area During Reporting Period
Lucas, Robert J. Co-op Trainee		447	
Martin, E. Eugene Research Engineer		13	
McManus, J. Barry Co-op Trainee		16	
Miller, Thomas M. Research Engineer		140	
Pugh, William E. Graduate Research Assistant		20.5	
Siegel, William G. Co-op Trainee		64.5	
Smilay, David H. Co-op Trainee		8	
Trebits, Robert N. Research Scientist	169	883	Data Collection
Weaver, E. Eugene Assistant Research Scientist		325	

Visits

Dr. R. N. Trebits visited Eglin AFB, Florida during 9-20 October 1972; Mr. R. J. Hodges visited this location during 9-14 October 1972; and Mr. J. D. Higgins visited this location during 17-20 October 1972. The purpose of these visits was to collect the video data from Test Sites A-3 and A-7.

Future Effort

The majority of the next reporting period will be utilized to reduce and analyze the data from the CPA evaluation tests conducted at Test Site A-7,

Future Effort (Continued)

Eglin AFB, Florida. The results from these tests will be summarized and submitted to the Project Engineer.

Respectfully submitted,

Richard J. Hodges
Project Director

RJH:sp

Approved:

H. Allen Ecker
Chief, Radar Division

SUMMARY OF MISSION HOURS AND OVERTIME ESTIMATES

Date	Location	Mission Hours	Estimates		
			Overtime Hours	No. Personnel On Overtime	Overtime Manhours
10-10-72	A-7	6.00	0	--	0
10-11-72	A-7	6.00	0	--	0
10-11-72	Bldg. 380	4.50	0	--	0
10-12-72	Bldg. 380	6.50	0	--	0
10-13-72	A-7	8.50	5.00	3	15.00
10-13-72	Bldg. 380	7.50	0	--	0
10-16-72	A-7	3.00	1.00	3	3.00
10-17-72	A-7	5.50	5.00	3	15.00
10-17-72	Bldg. 380	5.00	0	--	0
10-18-72	A-3	2.00	0	--	0
10-18-72	Bldg. 380	4.00	0	--	0
10-19-72	Bldg. 380	6.00	1.00	1	1.00
October	Totals	64.50	12.00		34.00
June	Totals	35.00	39.75		403.25
May	Totals	29.00	41.25		288.75
April	Totals	41.75	47.00		229.00
March	Totals	58.50	87.75		296.75
February	Totals	14.25	14.25		41.00
Cumulative Totals		243.00	242.00		1292.75

ENGINEERING EXPERIMENT STATION
GEORGIA INSTITUTE OF TECHNOLOGY • ATLANTA, GEORGIA 30332

1 March 1973

Air Force Avionics Laboratory
Wright-Patterson Air Force Base,
Ohio 45433

Attention: Mr. James V. Kastle - AFAL/WRW

Subject: Status Report 22
Project 7636
"Polarization Modulation Techniques"
Contract No. F33615-71-C-1519

Gentlemen:

A summary of the progress for the period 1 January through 31 January 1973 is contained herein.

Technical Progress

Georgia Tech began working on the follow-on effort to the subject contract on 2 January 1973. The objectives of this additional effort are to design and fabricate a pulse-to-pulse polarimeter and to evaluate the CPA with a modern sophisticated radar possessing monopulse and chirp modes of operation.

First Lieutenant J. W. Briggs of TGYED at Eglin AFB, Florida was notified on 11 January 1973 that no additional efforts would be expended on Project 7636PY01, "Support of CPA Evaluation." Thus, this project at Eglin AFB can be officially terminated.

The Interim Technical Report entitled "Polarization Modulation Techniques" was distributed on 25 January 1973.

The data analysis from the CPA evaluation tests conducted at Test Site A-7, Eglin AFB, Florida continued throughout this reporting period. The results of the tests conducted with the WEST IX system were reported in an Interim Technical Report entitled "Analysis of WEST IX Data." This report was submitted to the Project Engineer on 29 January 1973. The data analysis is being continued for the remaining tests that were conducted at Test Site A-7. These tests include 63 runs that utilized the SADS I and AN/MPQ-T1 and 584 runs utilizing only the SADS I system.

A paper entitled "Comparison of Polarization Properties of Track-While-Scan Radars" is being prepared for presentation at the Nineteenth Annual Tri-Service Radar Symposium. A summary of this paper was submitted to Mr. William J. Edwards at the Air Force Avionics Laboratory on 29 January 1973. This paper will utilize data that were collected during the field test operations recently conducted at Eglin AFB, Florida. The tentative classification of this paper is Secret, formerly Group 1 and not automatically declassified, and not releasable to Foreign Nationals.

An effort has been initiated to increase the versatility of the CPA. The first task being performed under this effort is to modify the sampling oscilloscope. This modification will provide capabilities for operating the oscilloscope with either 60 Hz or 400 Hz primary voltage. When this modification is completed, the CPA and all of its ancillary equipment will have the capability of being operated with 400 Hz primary voltage.

Report of Effort

Name	January Hours	Cumulative Hours	Technical Area During Reporting Period
Akridge, James M. Senior Research Engineer		102	
Burns, C. Patrick Research Engineer		28	
Cain, Fred L. Senior Research Engineer		8	
Cherry, Bruce M. Assistant Research Engineer		221	
DeCastra, Joseph E., III Co-op Trainee	109	566	Engineering Assistance
Ecker, H. Allen Principal Research Engineer		379	
Edwards, J. Lee Senior Research Scientist		1666	
Evans, James L. Co-op Trainee		83	

Report of Effort (Continued)

Name	January Hours	Cumulative Hours	Technical Area During Reporting Period
Foard, William W. Co-op Trainee	112	739	Engineering Assistance
Flynt, Edward R. Principal Research Engineer		346	
Greneker, Eugene F. Assistant Research Scientist		199	
Higgins, James D. Assistant Research Engineer		2851	
Hodges, Richard J. Research Engineer	77	3434	Project Director
Klien, Stephen B. Co-op Trainee		72	
Lucus, Robert J. Co-op Trainee		447	
Martin, E. Eugene Research Engineer		13	
McManus, J. Barry Co-op Trainee		16	
Miller, Thomas M. Research Engineer		140	
Pugh, William E. Graduate Research Assistant		20.5	
Siegel, William G. Co-op Trainee		64.5	
Smilay, David H. Co-op Trainee		8	
Trebits, Robert N. Research Scientist	184	1411	Data Analysis
Weaver, E. Eugene Assistant Research Scientist		325	

Future Effort

The reduction and analysis of the data from the CPA evaluation tests conducted at Test Site A-7, Eglin AFB, Florida will continue throughout the next reporting period.

The effort to update the CPA and increase its versatility will continue throughout the next reporting period. The CPA control unit will be investigated to determine the feasibility of reducing its frequency sensitivity, separating the external phase inputs, and improving its internal noise sources.

Respectfully submitted,

Richard J. Hodges
Project Director

Approved:

H. A. Ecker
Chief, Radar Division

ENGINEERING EXPERIMENT STATION
GEORGIA INSTITUTE OF TECHNOLOGY • ATLANTA, GEORGIA 30332

13 April 1973

Air Force Avionics Laboratory
Wright-Patterson Air Force Base,
Ohio 45433

Attention: Mr. James V. Kastle - AFAL/WRW

Subject: Status Report 23
Project 7636
"Polarization Modulation Techniques"
Contract No. F33615-71-C-1519

Gentlemen:

A summary for the period 1 February through 28 February 1973 is contained herein.

Technical Progress

An effort has been initiated to increase the versatility of the CPA. The first task completed under this effort was to modify the sampling oscilloscope. This modification provided the capability for operating the oscilloscope with either 60 Hz or 400 Hz primary voltage. Thus, the CPA and all its ancillary equipment can now be operated with 400 Hz primary voltage.

It may become necessary to build additional electronic phase shifters for use in the CPA. If so, it would be desirable to build phase shifters that are similar to those contained in the CPA. The Project Engineer has been requested to aid Georgia Tech in obtaining a copy of the engineering drawings that were used to fabricate the existing phase shifters.

The paper entitled "Comparison of Polarization Properties of Track-While-Scan Radars" has been accepted for presentation at the Nineteenth Annual Tri-Service Radar Symposium. This paper utilizes data that were collected during the field test operations recently conducted at Eglin AFB, Florida. The tentative classification of this paper is Secret, formerly Group 1 and not automatically declassified, and not releasable to Foreign Nationals.

A copy of "Measurements Data from Eglin Air Force Base, Florida" was submitted to the Project Engineer on 27 February 1973. These data were collected during the measurements phase of the field test operations recently conducted at Test Sites A-3 and A-7.

Report of Effort

Name	February Hours	Cumulative Hours	Technical Area During Reporting Period
Akridge, James M. Senior Research Engineer		102	
Burns, C. Patrick Research Engineer		28	
Cain, Fred L. Senior Research Engineer		8	
Cherry, Bruce M. Assistant Research Engineer		221	
DeCastra, Joseph E., III Co-op Trainee	40	606	Engineering Assistance
Ecker, H. Allen Principal Research Engineer		379	
Edwards, J. Lee Senior Research Scientist		1666	
Evans, James L. Co-op Trainee		83	
Foard, William W. Co-op Trainee	128	867	Engineering Assistance
Flynt, Edward R. Principal Research Engineer		346	
Greneker, Eugene F. Assistant Research Scientist		199	
Higgins, James D. Assistant Research Engineer		2851	
Hodges, Richard J. Research Engineer	66	3500	Project Director
Klien, Stephen B. Co-op Trainee		72	

Report of Effort (Continued)

Name	February Hours	Cumulative Hours	Technical Area During Reporting Period
Lucas, Robert J. Co-op Trainee		447	
Martin, E. Eugene Research Engineer		13	
McManus, J. Barry Co-op Trainee		16	
Miller, Thomas M. Research Engineer		140	
Pugh, William E. Graduate Research Assistant		20.5	
Siegel, William G. Co-op Trainee		64.5	
Smilay, David H. Co-op Trainee		8	
Trebits, Robert N. Research Scientist	152	1563	Data Analysis
Weaver, E. Eugene Assistant Research Scientist		325	

Visits

Messrs. J. D. Higgins and R. J. Hodges of Georgia Tech visited Mr. J. V. Kastle at the Air Force Avionics Laboratory on 27 February 1973. The purpose of this visit was to discuss work to be performed on the subject contract.

Future Effort

The reduction and analysis of the data from the CPA evaluation tests conducted at Test Site A-7, Eglin AFB, Florida will continue throughout the next reporting period.

The effort to update the CPA and increase its versatility will continue throughout the next reporting period. The CPA control unit will be investigated to determine the feasibility of reducing its frequency sensitivity, separating the external phase inputs, and improving its internal noise sources.

Respectfully submitted,

Richard J. Hodges
Project Director

RJH:sp

Approved:

H. Allen Ecker
Chief, Radar Division

LIBRARY DOES NOT HAVE STATUS REPORTS 2,3,6,7,8,10,14,17,20,21,24.
INTERIM REPORTS 1,2.
TRACE REPORT.
PAPERS FOR 19TH ANNUAL TRI-SERVICE RADAR SYMPOSIUM
FINAL REPORT.

THESE REPORTS ARE CLASSIFIED SECRET.